

1 1. A dual-mode transceiver of the indoor and outdoor
2 UWB communication comprising:
3 a digital enlarged band lowpass-shaping
4 transmitter FIR filters for the indoor UWB operation;
5 a digital enlarged band lowpass-shaping
6 transmitter FIR filter for the outdoor UWB operation; and
7 a common digital rejected image spectrum
8 transmitter FIR filter.

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10 2. The dual-mode transceiver of claim 1 wherein the
11 cascaded two digital filters of said indoor digital
12 enlarged band lowpass-shaping transmitter FIR filter and
13 said common digital rejected image spectrum transmitter FIR
14 filter are used for implementing an indoor UWB transceiver
15 mode.

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17 3. The dual-mode transceiver of claim 1 wherein the
18 cascaded two digital filters of said outdoor digital
19 enlarged band lowpass-shaping transmitter FIR filter and
20 said common digital rejected image spectrum transmitter FIR
21 filter are used for implementing a outdoor UWB transceiver.

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23 4. The dual-mode transceiver of claim 1 wherein said
24 common digital rejected image spectrum transmitters FIR
25 filter comprising two filter structures is only one filter

26 that can be used for both of the indoor and outdoor UWB
27 operation mode.

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29 5. The dual-mode UWB transceiver of claim 4 wherein
30 said common digital rejected image spectrum transmitter FIR
31 filter contains two sub-filters, one sub-filter with even
32 filter taps and other sub-filter with odd filter taps.

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34 6. The dual-mode transceiver of claim 5 wherein said
35 even tap sub-filter and said odd tap sub-filter stored in
36 memory banks are implemented with polyphase structure by
37 controlling a switch.

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39 7. The dual-mode UWB transceiver of claim 1 wherein
40 said indoor digital enlarged band lowpass-shaping
41 transmitter FIR filter coupled to said common digital
42 rejected image spectrum transmitter FIR filter is a
43 combination interpolation lowpass-shaping transmitter FIR
44 filter with upsampling of 2 for implementing an indoor UWB
45 transceiver.

46

47 8. The dual-mode transceiver of claim 1 wherein said
48 outdoor digital enlarged band lowpass-shaping transmitter
49 FIR filter coupled to said common digital rejected image
50 spectrum transmitter FIR filter is a combination
51 interpolation lowpass-shaping transmitter FIR filter with

52 upsampling of 2 for implementing an outdoor UWB
53 transceiver.
54

55 9. The dual-mode transceiver of claim 1 wherein said
56 indoor digital enlarged band lowpass-shaping transmitter
57 FIR filter and said outdoor digital enlarged band lowpass-
58 shaping transmitter FIR filter and said common digital
59 rejected image spectrum transmitter FIR filter stored in
60 memory banks are programmable filter taps.
61

62 10. The dual-mode transceiver of claim 9 wherein said
63 indoor and outdoor digital enlarged band lowpass-shaping
64 transmitter FIR filters are programmable to have 51 odd
65 symmetric filter taps, and said common digital rejected
66 image spectrum FIR filter is programmable to have 6 even
67 symmetric filter taps.
68

69 11. A dual-mode implementation system of digital
70 lowpass-shaping transmission FIR filter
71 comprising:
72 a set of memory banks;
73 a set of counter units;
74 a set of MAC units;
75 a pre-addition unit;
76 a MUX unit; and
77 a selectable unit.

78 12. The dual-mode implementation system of digital
79 lowpass-shaping transmission FIR filter of claim 11 wherein
80 the input samples are added together with symmetric using
81 said pre-addition unit.

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83 13. The dual-mode implementation system of digital
84 lowpass-shaping transmission FIR filter of claim 11 wherein
85 said MUX unit with said selectable unit is used to select
86 either said memory bank of the indoor digital enlarged band
87 transmitter FIR filter coefficients or the memory bank of
88 the outdoor digital enlarged band transmitter FIR filter
89 coefficients.

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91 14. The dual-mode implementation system of digital
92 lowpass-shaping transmission FIR filter of claim 11 wherein
93 the first stage outputs in the data memory bank may be
94 multiplied with the common digital FIR filter taps of the
95 polyphase memory banks to produce the output for a digital-
96 to-analog converter.

97

98 15. The dual-mode implementation system of digital
99 lowpass-shaping transmission FIR filter of claim 14 wherein
100 the same reconstruction analog filter and said digital-to-
101 analog converter for both indoor and outdoor UWB
102 transceiver modes.

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104 16. A dual-mode indoor and outdoor UWB receiver FIR
105 filter comprising:

106 an indoor digital lowpass receiver FIR filter;
107 and an outdoor digital lowpass receiver FIR
108 filter.
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110 17. The dual-mode indoor and outdoor UWB receiver FIR
111 filter of claim 16 wherein said indoor digital receiver FIR
112 filter and said outdoor digital receiver FIR filter are
113 programmable to have 39 filter taps with odd symmetric.
114

115 18. An article comprising a medium for storing
116 instructions that cause a digital signal processor-based
117 dual-mode indoor and outdoor UWB transceiver to:

118 Selectively set the memory bank of transmitter
119 filter in the first filtering stage depending on whether an
120 indoor or outdoor UWB transmission signal has been
121 detected; and resulting output of the first filtering stage
122 as the input samples are filtered by the common digital
123 rejected transmitter filter;

124 Selectively set the memory bank of receiver
125 filter depending on whether an indoor or outdoor UWB
126 receiver signal has been received.
127

128 19. The article of claim 18 further storing
129 instructions that cause a digital signal processor-based

130 dual-mode indoor and outdoor UWB transmitter to control the
131 MUX unit to select either the memory bank of said indoor
132 digital enlarged band lowpass-shaping transmitter FIR
133 filter taps or the memory bank of said outdoor digital
134 enlarged band lowpass-shaping transmitter FIR filter taps
135 multiplied with the input samples as the outputs coupled to
136 the polyphase-based digital rejected FIR filter.

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138 20. The article of claim 18 further storing
139 instructions that cause digital signal processor-based
140 dual-mode indoor and outdoor UWB receiver to control said
141 MUX unit to select either the memory bank of said indoor
142 digital receiver FIR filter taps or the memory bank of said
143 outdoor digital receiver FIR filter taps multiplied with
144 the input samples.